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## (54) FLUORESCENT INK COMPOSITION AND FLUORESCENT MARK FORMED FROM THE FLUORESCENT INK COMPOSITION

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To obtain a fluorescent ink composition not generating an ooze and excellent in dispersion stability, light resistance and water resistance, to obtain a high concentration fluorescent mark formed from the fluorescent ink composition, and to obtain an infrared light fluorescent mark of being well read even when the infrared light fluorescent mark is disposed on an infrared light-absorbing article to be marked, and suitable for the highly dense formation of bar codes.

**SOLUTION:** This fluorescent ink composition and this fluorescent mark each contains water-dispersible colloidal silica having a resin component on the surface and exhibiting fluorescence in a visible light region. The infrared light fluorescent ink composition and this infrared light fluorescent mark each contains water-dispersible colloidal silica having a resin component on the surface, absorbs infrared light in wavelengths of  $\geq 700\text{nm}$  and exhibits infrared light in an infrared light region.

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[Claim(s)]

[Claim 1] A fluorescence ink constituent which shows fluorescence to the surface in a light field including water-dispersion colloidal silica which has a resinous principle [Claim 2] An infrared fluorescence ink constituent which absorbs infrared light with a wavelength of 700nm or more, and shows luminescence to an infrared region including water-dispersion colloidal silica which has a resinous principle on the surface [Claim 3] A fluorescence mark which shows fluorescence to the surface in a light field including water-dispersion colloidal silica which has a resinous principle [Claim 4] An infrared fluorescence mark which absorbs infrared light with a wavelength of 700nm or more, and shows luminescence to an infrared region including water-dispersion colloidal silica which has a resinous principle on the surface [Claim 5] An infrared fluorescence mark according to claim 4 10 - 90% of whose build up time of the luminescence maximum output when irradiating infrared light at an infrared fluorescence mark is less than 10microsec

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] About the fluorescence mark formed with a fluorescence ink constituent and this fluorescence ink constituent, a blot does not arise, and this invention does not have in more detail, the blot formed with the fluorescence ink constituent excellent in distributed stability, lightfastness, and a water resisting property, and this fluorescence ink constituent, and relates to the high-concentration fluorescence mark excellent in lightfastness and a water resisting property.

[0002]

[Description of the Prior Art] In recent years, information, such as a manufacturer, a trade name, etc. about goods, is displayed by a bar code etc., and using the striped pattern for the sales total of goods, analysis of circulation, etc. as reading by the optical detecting method is performed. This kind of bar code is printed using an ink jet printer

etc., and is usually suitable for a classification of the goods in the dealer treating a variety of goods etc., and discernment. For this reason, recently, it is used for the mail which applies the system which there are [ many goods using this bar code system are not only seen, but ] some which applied this system to file management etc., for example, distributes goods by division by code management.

[0003] however, as a method of printing a bar code, conventionally Since the method of printing a black bar code to a white ground is adopted and this method uses the difference of the reflection factor of a white ground and black figures, Since it has the defect that a readout becomes difficult extremely and the reflected light of a visible region is further used inevitably by this method when dirt arises on goods, the appearance of goods may be spoiled.

[0004] For this reason, as an amelioration type of such a monochrome bar code, it excites by ultraviolet radiation, and the fluorescence mark which emits light in the light is used, or it excites by infrared light, and the infrared fluorescence bar code (\*\*\*\*\* 6-500590) which emits light in infrared light is proposed.

[0005]

[Problem(s) to be Solved by the Invention] However, since the fluorescent substance which excites by ultraviolet radiation and emits light in the light is what is essentially seen in a visible region, it it not only spoils the appearance of goods, but has the problem that reading becomes difficult with the dirt on a mark etc., like monochrome bar code.

[0006] Moreover, although it is possible for it not to be influenced so much by the dirt on a mark, either, but to detect a mark, without spoiling the appearance of goods by existence of a bar code since it does not have luminescence by the light when the infrared fluorescent substance which excites by infrared light and emits light in infrared light is used Since these infrared fluorescent substances become the wavelength of an infrared region from the infrared fluorescent dye which absorbs and emits light, When a marked object is what is easy to absorb ink like Japanese paper, and this color is ink-ized and it prints with an ink jet printer etc., a blot of the ink called a feathering phenomenon may occur, it may read by this, and a rate may fall and misoperate. Furthermore, although it tends to carry out densification of the record of a bar code, since the gap of a bar code becomes narrow in this case, this phenomenon serves as a fatal defect and has a problem practically.

[0007] Moreover, the organic dye which that to which a marked object absorbs infrared light, for example, read when black, becomes difficult, and they use for this ink further since the ink of these former has the property to dye the marked object which is the property of color original has lightfastness and a bad water resisting property, and has a problem of it becoming impossible to decode the mark in which it was formed.

[0008] moreover, the example using the inorganic compound which contains neodymium, an yttrium, etc. as an infrared fluorescent substance -- there is it (the United States Patent official report No. 4202491, JP,54-22326,B, JP,53-9607,A, etc.) -- since these inorganic fluorescent substances have the slow rate of rise which emits light in infrared light, when reading the mark of a bar code etc. at high speed, the adjoining mark and output lap and they have the problem that distinction of a mark cannot be performed.

[0009] When this invention was not made as a result of examining many things in view of this present condition, a blot does not produce it, but the fluorescence ink constituent excellent in distributed stability, lightfastness, and a water resisting property is offered and it forms a fluorescence mark using print devices, such as an ink jet printer, there is no blot and the high-concentration fluorescence mark excellent in lightfastness and a water resisting property is obtained.

[0010] Moreover, the infrared fluorescence mark suitable for the densification of a bar code is obtained, without being able to perform good reading and limiting a marked object, even when an infrared fluorescence mark is prepared on the marked object which absorbs infrared light.

[0011] Furthermore, there is no sedimentation, conservation stability is good, and when there is no condensation of ink and desiccation solidification is carried out, it is going to offer the ink constituent excellent in redispersible which is satisfactory practically.

[0012]

[Means for Solving the Problem] A fluorescence ink constituent of this invention shows fluorescence to the surface in a light field including water-dispersion colloidal silica which has a resinous principle. Moreover, while absorbing infrared light with a wavelength of 700nm or more including water-dispersion colloidal silica which has a resinous principle on the surface, luminescence is shown in an infrared region.

[0013] Moreover, a fluorescence mark of this invention shows fluorescence to the surface in a light field including water-dispersion colloidal silica which has a resinous principle. Moreover, while absorbing infrared light with a wavelength of 700nm or more including water-dispersion colloidal silica which has a resinous principle on the surface, luminescence is shown in an infrared region, and he is trying for 10 - 90% of build up time of the luminescence maximum output when irradiating infrared light further to become less than 10microsec.

[0014]

[Embodiment of the Invention] Since the fluorescence ink constituent of this invention contains the water-dispersion colloidal silica which has a resinous principle on the surface, in an ink solution, a silica particle does not produce precipitate but a good printing property is acquired also in a jet type arm head like an ink jet printer.

[0015] Moreover, the fluorescence ink constituent of this invention can obtain the ink constituent excellent in distributed stability, without fluorescent dye's combining with the resinous principle of the surface of water-dispersion colloidal silica, and a silica particle and a color dissociating, since the water-dispersion colloidal silica which has a resinous principle on the surface with fluorescent dye is included.

[0016] Furthermore, the fluorescence ink constituent of this invention can acquire a good printing property, without a color dissociating with an ink medium, even when the resinous principle of the silica particle surface dissolves in part into a solution, this resinous principle and fluorescent dye that dissolved join together also in an organic solvent system like a ketone solvent and a print is carried out since water-dispersion colloidal silica is included.

[0017] Moreover, when using for ink jet printers, since redispersible [ of ink ] is required, it is needed for an ink constituent not to carry out film formation, but in the ink constituent of this invention, since the water-dispersion colloidal silica which has a resinous principle on the surface is included, it excels in dispersibility and wettability with the same solvent as the case of only the conventional color can be secured.

[0018] In addition, although it becomes [ an image ] clearer and is more desirable as particle diameter is large since concealment nature of water-dispersion colloidal silica which has a resinous principle on the surface of this invention improves so that particle diameter becomes large, as for the point of productivity and versatility to particle diameter, it is desirable that it is [ 5nm or more ] 1 micrometer or less.

[0019] The water-dispersion colloidal silica which has a resinous principle on such the surface is used as what has the suitable thing which made the acrylic acid, the methacrylic acid, the crotonic acid, etc. put on the particle surface of a silica, and; acrylic denaturation silica sol by NIPPON SHOKUBAI Co., Ltd. etc. is mentioned as an example.

[0020] If the water-dispersion colloidal silica which has a resinous principle on such the surface is used with fluorescent dye and/or a white fluorescent brightener, the ink constituent which shows fluorescence to the surface in a light field including the water-dispersion colloidal silica which has a resinous principle is obtained, while excelling in distributed stability, a blot will not arise, but the fluorescence ink constituent excellent in lightfastness and a water resisting property will be obtained.

[0021] Moreover, if fluorescent dye and/or a white fluorescent brightener are mixed to the water-dispersion colloidal silica which has a resinous principle on the surface, the water-dispersion colloidal silica to which colored fluorescent dye has a resinous principle on the surface is adsorbed, the fluorescence organic pigment which maintained the property of fluorescent dye and/or a white fluorescent brightener as it was will be

obtained, such a fluorescence organic pigment will be used, and a fluorescence ink constituent will be obtained. Effect of the substrate at the time of printing can be made hard for the fluorescence ink constituent which used such a fluorescence organic pigment to have a property as a pigment, for a blot not to produce it, even if it uses it unlike fluorescent dye, when forming a mark in paper etc., but to excel in distributed stability, lightfastness, a water resisting property, and coloring nature, to be able to give concealment nature, since it is a pigment further, and to be influenced.

[0022] Thus, as fluorescent dye used in order to obtain a fluorescence organic pigment from the water-dispersion colloidal silica which has a resinous principle on the surface, the thing of any structures can be used, for example, acid dye, direct dye, cationic dye, mordant dye, acid mordant dye, a disperse dye, reactive dye, oxidation dye, etc. are used preferably. Moreover, a white fluorescent brightener is also independent or is preferably used with these fluorescent dye.

[0023] As an example of fluorescent dye ACID shown by Calah-index number - (C-I) YELLOW3, ACID YELLOW7 and ACID RED52, ACID RED77 and ACID RED87, ACID RED92 and ACID BLUE9, BACIC YELLOW1 and BACIC YELLOW40, BACIC RED1 and BACIC RED13, BACIC VIOLET7 and BACIC VIOLET10 and BACIC ORANGE22, BACIC BLUE7 and BACIC GREEN1, DISPERSE YELLOW121, DISPERSE YELLOW82, DISPERSE ORANGE11, DISPERSERED58, DISPERSE BLUE7 and DIRECT YELLOW85, DIRECT ORANGE8, DIRECT RED9, DIRECT BLUE22, DIRECT GREEN6, FLUORESCENT BRIGHTENING AGENT55 and FLUORESCENT BRIGHTENING WHITEX WS52, FLUORESCENT162, FLUORESCENT112, SOLVENT YELLOW44, SOLVENT RED49, SOLVENT BLUE5, SOLVENT PINK, SOLVENT GREEN7, PIGMENT BLUE15, PIGMENT GREEN7, PIGMENT RED53, PIGMENT RED57, PIGMENT YELLOW1 etc. is mentioned.

[0024] Moreover, as an example of a white fluorescent brightener, it is Fluorescent Brightening Agent 85, 86, 22, 174, 166, 90, 134, 84, 24, 87, 175, 176, 169, 167, 173, 14, 32, 30, 177, 153, 168, 37, 104, 45, 55, 52, 54, 56, 171, 170, 135, 162, 163, 164, 112, 121, 172, and 91 etc. is mentioned.

[0025] When obtaining a fluorescence organic pigment, if it is desirable that it is 0.001 - 10% of the weight of within the limits and it is fewer than this, even if many [ acquire / sufficient color / and / too ], sufficient color will not be acquired to the water-dispersion colloidal silica to which the content rate of the water-dispersion colloidal silica which has a resinous principle on the surface, and the fluorescent dye and/or the white fluorescent brightener with which it adsorbs has a resinous principle on the surface.

[0026] Moreover, if the water-dispersion colloidal silica which has a resinous principle on the surface is used for an infrared wavelength field 700nm or more with the organic

dye and/or the white fluorescent brightener which show fluorescence, while absorbing the infrared wavelength of 700nm or more including the water-dispersion colloidal silica which has a resinous principle on the surface, the ink constituent which shows luminescence to an infrared region is obtained, while excelling in distributed stability, a blot will not arise, but the fluorescence ink constituent excellent in lightfastness and a water resisting property will be obtained.

[0027] Furthermore, if the organic dye and/or the white fluorescent brightener which show fluorescence to the water-dispersion colloidal silica which has a resinous principle on the surface to an infrared wavelength field 700nm or more are mixed The organic dye and/or the white fluorescent brightener which show fluorescence to an infrared wavelength field The water-dispersion colloidal silica which has a resinous principle on the surface is adsorbed, the infrared fluorescence organic pigment which maintained the property of the organic dye which shows fluorescence to an infrared wavelength field, and/or a white fluorescent brightener as it was is obtained, such an infrared fluorescence organic pigment is used and an infrared fluorescence ink constituent is obtained. Effect of the substrate at the time of printing can be made hard for the fluorescence ink constituent which used such an infrared fluorescence organic pigment to have a property as a pigment, for a blot not to produce it, even if it uses it unlike fluorescent dye, when forming a mark in paper etc., but to excel in distributed stability, lightfastness, a water resisting property, and coloring nature, to be able to give concealment nature, since it is a pigment further, and to be influenced.

[0028] As organic dye which shows fluorescence, the thing of any structures can be used for an infrared wavelength field 700nm or more, for example, poly methine system coloring matter, anthraquinone system coloring matter, dithiol metal salt system coloring matter, phthalocyanine system coloring matter, indophenol system coloring matter, a SHIAMIN system, a styryl system, aminium system coloring matter, G MONIUMU system coloring matter, azo system coloring matter, etc. are used preferably. Moreover, the thing same as a white fluorescent brightener as what is used for the aforementioned fluorescence ink constituent is used preferably, and may mix a colored color further.

[0029] as the example of poly methine system coloring matter -- made in KODAKKU Laboratories Chemical --;IR-140, IR[ by Nippon Kayaku Co., Ltd. ]-820B, etc. mention -- having -- moreover -- as the example of cyanine system coloring matter -- Japanese sensitizing dye company make -- NK-1144, NK-123, NK-78, etc. are mentioned. Moreover, as an example of a white fluorescent brightener,; Mika White ACR by Nippon Kayaku Co., Ltd., Kayapor3BS, etc. are mentioned.

[0030] When obtaining an infrared fluorescence organic pigment, if it is desirable that it

is 0.001 - 10% of the weight of within the limits and it is fewer than this, sufficient color and a fluorescence operation will not be acquired to the water-dispersion colloidal silica to which the content rate of the organic dye which shows fluorescence to the infrared wavelength field 700nm or more to which the water-dispersion colloidal silica which has a resinous principle on the surface is adsorbed, and/or a white fluorescent brightener has a resinous principle on the surface. Moreover, even if many [ too ], a color becomes deep too much, sufficient color is not acquired, concentration quenching is started and a fluorescence operation is not acquired.

[0031] Thus, the water-dispersion colloidal silica which has a resinous principle on the surface To the water-dispersion colloidal silica which uses together with fluorescent dye and/or a white fluorescent brightener, or has a resinous principle on the surface The ink constituent which used the fluorescence organic pigment which adsorbed fluorescent dye and/or a white fluorescent brightener, And [ whether the water-dispersion colloidal silica which has a resinous principle on the surface is used together with the organic dye and/or the white fluorescent brightener which have absorption in an infrared wavelength field 700nm or more, and ] Or the ink constituent which used the infrared fluorescence organic pigment which made organic dye and/or a white fluorescent brightener with absorption stick to an infrared wavelength field 700nm or more for the water-dispersion colloidal silica which has a resinous principle on the surface The water-dispersion colloidal silica, the fluorescent dye and/or white fluorescent brightener, or fluorescence organic pigment which has a resinous principle on these surfaces, Moreover, to the water-dispersion colloidal silica and the infrared wavelength field 700nm or more which have a resinous principle on the surface, binder resin and when required, mixed distribution of organic dye and/or a white fluorescent brightener, or an infrared fluorescence organic pigment with absorption is carried out with a solvent, and it is prepared.

[0032] Here, each thing generally used conventionally is used as binder resin, for example, polyvinyl alcohol, acrylic resin, polyethylene oxide, starch, the formalin condensate of a naphthalene sulfonate, a carboxymethyl cellulose, etc. are used.

[0033] Moreover, as a solvent used if needed, it is independent, or they are used by aprotic solvents, such as a ketone besides a protic solvent like water and alcohol, and ester, etc., mixing.

[0034] Thus, the fluorescence ink constituent and infrared fluorescence ink constituent which are prepared are used for various printing methods, such as the object for ink jet printers, screen-stencil, offset printing, gravure, Toppan Printing, and an object for tampon printing, and a dispersant, a defoaming agent, a surfactant, a moisturizer, an antioxidant, an antifungal agent, a conductive grant agent, etc. are used according to

the case where it applies to various printing methods.

[0035] The fluorescence mark formed with such a fluorescence ink constituent and an infrared fluorescence ink constituent A light field shows fluorescence, or while absorbing infrared light with a wavelength of 700nm or more, luminescence is shown in an infrared region. The infrared fluorescence mark which absorbs especially infrared light with a wavelength of 700nm or more, and shows luminescence to an infrared region Since there are not absorption of a visible region and luminescence, appearance of goods is not spoiled and it becomes possible [ the quality of the material of a marked object, a configuration, etc. ] to form the infrared fluorescence mark which is not further influenced by the dirt on a mark.

[0036] At the time of \*\* to which the reflection factor of infrared light with a wavelength of 700nm or more gives the mark which shows fluorescence to the infrared wavelength field 700nm or more which consists of an ink constituent of this invention here to the marked object of 50% or more of white It is the reflected power (standard white, made in a standard colored-paper research institute: standard white No. 18) of a marked object C0 It is an output when having carried out, irradiating infrared light and measuring it to an infrared fluorescence mark, C1 If it carries out C0 / C1 a ratio is 4% or less -- desirable -- C0/C1 when a ratio is 4% or less, it does not misoperate, even if it carries out reading actuation -- it can read and a rate can be secured.

[0037] At moreover, the time of \*\* to which the reflection factor of infrared light with a wavelength of 700nm or more gives an infrared fluorescence mark to 10% or less of black marked object It is an output when irradiating infrared light and measuring it to this infrared fluorescence mark, C2 If it carries out these C2 Output C1 when irradiating infrared light and measuring it to the aforementioned infrared fluorescence mark, A ratio C2 / C1 it is 5% or more -- desirable -- C2 / C1 That it is 5% or more While it can read without detecting an infrared fluorescent substance by standard Shirakami, and misoperating an infrared fluorescence mark, even if it is in a black marked lifter, an infrared fluorescence mark can be read satisfactory.

[0038] On the other hand, it is only the power ratio C0 in standard Shirakami / C1. When it considers as 4% or less, even if it can detect mark \*\* which shows fluorescence to an infrared wavelength field 700nm or more satisfactory, when the substrate is colored (for example, when the mark of an infrared fluorescent substance is prepared in the marked lifter containing black, especially carbon black), sufficient output cannot be obtained, but it becomes a readout error and misoperates. For this reason, C0 / C1 It is 4% or less, and is C2 / C1. It is needed 5% or more.

[0039] Moreover, when performing the infrared fluorescence mark given to the marked lifter by high-speed reading, improvement in the speed of the speed of response from an

infrared fluorescence mark is needed, but when the infrared fluorescence mark of this invention is used, 10 - 90% of build up time of the maximum output is able to carry out to less than 10microsec, and excitation light sufficient also in the time of high-speed reading of 4 or more m/sec can be obtained.

[0040] Thus, while the infrared fluorescence mark formed can make hard to be influenced effect of a blot of the dirt on a mark and ink, the effect of the substrate of a marked object can make hard to be influenced, therefore even when an infrared fluorescence mark is prepared on the marked object which has infrared absorption further, good reading can perform, and the infrared fluorescence mark which was suitable to the densification of a bar code is obtained, without limiting a marked object.

[0041] Thus, the reader which irradiates infrared light, can use it especially satisfactory as a reader which can use it for the infrared wavelength field of this invention obtained combining the mark which shows fluorescence if it is the reader which has the function in which infrared fluorescence is detectable, for example, shows drawing 1 is used.

[0042] If the reader which shows drawing 1 is explained hereafter, the reader which shows drawing 1 reads with reader optical system, it consists of circuits, and reader optical system consists of the semiconductor laser drive circuit 1, semiconductor laser 2, a lens 3, a total reflection mirror 4, plano-convex lenses 5 and 6, a slit 7, a filter 8, and a photodiode 9.

[0043] And the excitation light 10 irradiated from said semiconductor laser 2 converges on the diameter of 1mm with a lens 3, passes along the bore 41 established in the center of a mirror 4, and is perpendicularly irradiated to the plane of the infrared fluorescence mark support 11 through a lens 5. If a mirror 4 side is irradiated at this time without converging the excitation light 10, since the quantity of light (excitation energy) of the excitation light 10 which a part of excitation light 10 is cut by the periphery section of said light transmission 41, therefore reaches an infrared fluorescence mark side will decrease substantially and a radiant power output will become small as a result, it is necessary to regulate the diameter of focusing of the excitation light 10 below in the diameter of said light transmission 41.

[0044] The infrared fluorescence mark 12 is conveyed in the infrared fluorescence mark support 11 top at high speed, the excitation light 10 is irradiated by this infrared fluorescence mark 12, an infrared fluorescent substance is excited, and fluorescence is received with the 1st plano-convex lens 5. It is reflected by the mirror 4, and the received light converges with the 2nd plano-convex lens 6, penetrates the slit member 7 and a filter 8, and is received with a photodiode 9.

[0045] The reading circuit consists of an amplifying circuit, the detector 13 equipped with the filter circuit, the binarization processing circuit 14, a decoding circuit 15, serial

interface 16, and a personal computer 17 for data processing.

[0046]

[Example] Next, the example of this invention is explained. In addition, it cannot be overemphasized that this invention is not what is limited to these examples.

To the example 1 acrylic denaturation silica sol dispersion-liquid (NIPPON SHOKUBAI Co., Ltd. make; acrylic denaturation silica sol, solid content [ of 20 % of the weight ], particle diameter of 40nm) 100 weight section, the solution which dissolved the Rhodamine B (Sumitomo Chemical Co., Ltd. make) 0.3 weight section in the ethanol 6 weight section was added, it stirred and mixed and the peach-colored fluorescence organic pigment was obtained. To this, after carrying out 20 weight sections addition of 10 weight sections and the water and carrying out mixed distribution of the JON krill 61 (Johnson polymer company make; acrylic-styrene resin, 30 % of the weight of solid content) with a ball mill for 3 hours, the ink constituent was prepared through the 1-micron filter. And it printed in the paper with the ink jet printer using the ink constituent obtained by doing in this way.

[0047] It added stirring the solution made to dissolve the IR-820 (Nippon Kayaku Co., Ltd. make; peak:820nm [ of poly methine system coloring matter and absorption wavelength ], peak:900nm of luminescence wavelength) 0.1 weight section in the acetone 8 weight section to the example 2 acrylic denaturation silica sol dispersion-liquid (NIPPON SHOKUBAI Co., Ltd. make; acrylic denaturation silica sol, solid content [ of 20 % of the weight ], particle diameter of 30nm) 100 weight section, and the infrared fluorescence organic pigment was obtained. To this, 15 weight sections addition of 10 weight sections and the water was carried out, mixed distribution of the JON krill 61 (Johnson polymer company make; acrylic-styrene resin, 30 % of the weight of solid content) was carried out with the ball mill for 3 hours, and the ink constituent was prepared. Thus, bar code printing was carried out at one Japanese paper which divided the obtained ink constituent into the portion and 5% of portion whose reflection factor of 800nm infrared light is 70% using the ink jet printer.

[0048] The solution made to dissolve the IR-140 (made in KODAKKU Laboratories Chemicals; peak:826nm [ of poly methine system coloring matter and absorption wavelength ], peak:870nm of luminescence wavelength) 0.1 weight section in the dimethyl sulfoxide 5 weight section was added to the example 3 acrylic denaturation silica sol dispersion-liquid (NIPPON SHOKUBAI Co., Ltd. make; acrylic denaturation silica sol, solid content [ of 20 % of the weight ], particle diameter of 30nm) 100 weight section, stirring, and the infrared fluorescence organic pigment was obtained. To this, 15 weight sections addition of 10 weight sections and the water was carried out, the ball mill distributed the JON krill 61 (Johnson polymer company make; acrylic-styrene resin,

30 % of the weight of solid content) for 3 hours, and the ink constituent was prepared to it. Thus, bar code printing was carried out at one Japanese paper which divided the obtained ink constituent into the portion and 3% of portion whose reflection factor of 800nm infrared light is 60% using the ink jet printer.

[0049] Stirring mixing of the example of comparison 1 Rhodamine B (Sumitomo Chemical Co., Ltd. make) 1 weight section, the water 100 weight section, the glycerol 7 weight section, and the ethylene glycol 3 weight section was carried out, and the ink constituent was prepared through the 1-micron filter. And it printed in the paper with the ink jet printer using the ink constituent obtained by doing in this way.

[0050] It added mixing the solution made to dissolve the example of comparison 2IR820B(Nippon Kayaku Co., Ltd. make; peak:820nm [ of poly methine system coloring matter and absorption wavelength ], peak:900nm of luminescence wavelength) 0.15 weight section in the acetone 5 weight section in the solution which mixed the JON krill 61 (Johnson polymer company make; acrylic-styrene resin, 30 % of the weight of solid content) 30 weight section, and the water 90 weight section, and the ink constituent was prepared. Thus, bar code printing was carried out at one Japanese paper which divided the obtained ink constituent into the portion and 5% of portion whose reflection factor of 800nm infrared light is 70% using the ink jet printer.

[0051] It added mixing the solution made to dissolve the example of comparison 3IR140 (made in KODAKKU Laboratories Chemicals; peak:826nm [ of poly methine system coloring matter and absorption wavelength ], peak:870nm of luminescence wavelength) 0.05 weight section in the dimethyl sulfoxide 5 weight section in the solution which mixed the JON krill 61 (Johnson polymer company make; acrylic styrene resin, 30 % of the weight of solid content) 30 weight section, and the water 90 weight section, and the ink constituent was prepared. Thus, bar code printing was carried out at one Japanese paper which divided the obtained ink constituent into the portion and 3% of portion whose reflection factor of 800nm infrared light is 60% using the ink jet printer.

[0052] The ball mill distributed the example of comparison 4 inorganic fluorescent substance LiNd0.5 Yb0.5 P4 O128 weight section, the JON krill 61(Johnson polymer company make; acrylic styrene resin, 30 % of the weight of solid content) 6 weight section, and the water 40 weight section, and the ink constituent was prepared. Thus, bar code printing was carried out at one Japanese paper which divided the obtained ink constituent into the portion and 5% of portion whose reflection factor of 800nm infrared light is 70% using the ink jet printer.

[0053] About the ink constituent and printed matter which were obtained in the example 1 and the example 1 of a comparison, storage stability, lightfastness, blot nature, remelting nature, and an imprint property were examined by the following

method. In addition, it printed in this example and the example of a comparison, using ink jet printer [ by Hitachi, Ltd. ];GX-PA (nozzle diameter: 80 micrometers) as an ink jet printer.

[0054] <Storage stability> each ink constituent was saved in the 50-degree C thermostat for 100 hours, sedimentation of a fluorescent pigment was investigated, and the case where there were (O) and sedimentation about the case where there is no sedimentation was evaluated as (x).

[0055] <Light-fast> each printed matter was irradiated in fade meter for 1 hour, discoloration was observed visually, and the case where there were (O) and discoloration about a thing without discoloration was evaluated as (x).

[0056] The blot of the printing side of <blot nature> each printed matter was observed, and the case where there were (O) and a blot about the case where there is no blot was evaluated as (x).

[0057] <Remelting nature> each ink constituent is dropped on a PET film, desiccation solidification was carried out in the greenhouse for 24 hours, the alkaline water of pH11 was dropped at this, and (O) and the thing which is not re-distributed were evaluated for what is re-distributed as (x).

[0058] Applied the 5kg load to a 20-sheet pile and this, saved at the 30-degree C thermostat for 600 hours, what does not imprint <imprint property> each printed matter was made into (O), and what is imprinted was made into (x). As a result, the following table 1 is.

[0059]

表1

	貯蔵安定性	耐光性	滲み性	再溶解性	転写特性
実施例1	○	○	○	○	○
比較例1	○	×	×	○	○

[0060] Moreover, the emission spectrum of the printing side of the printed matter obtained in examples 2 and 3 and the examples 2 and 3 of a comparison was measured using the UNISOKU spectrum measuring device. Drawing 2 thru/or drawing 3 show the result, drawing 2 shows the emission spectrum of the printing side of the printed matter obtained in the example 2 and the example 2 of a comparison, and drawing 3 shows the emission spectrum of the printing side of the printed matter obtained in the example 3 and the example 3 of a comparison. Although about 10nm is shifted to a long

wavelength side from the infrared fluorescent dye used as a raw material so that clearly from this drawing 2 thru/or drawing 3, it turns out that the property of the infrared fluorescent dye of a basis is held.

[0061] Next, it measured on condition that the high-speed readout of 4 m/sec with the detector which shows the reflected power of a substrate, and the output of the infrared fluorescence mark of a bar code to drawing 1 about bar code printing of the Japanese paper obtained in examples 2-3 and the examples 2-4 of a comparison. this measurement -- setting -- the reflected power in the place of 50% of reflection factors -- C0 \*\* -- carrying out -- moreover, the output of the infrared fluorescence mark in the place of 50% of reflection factors -- C1 \*\* -- carrying out -- the output of the infrared fluorescence mark of the portion of 10% of reflection factors -- C2 \*\* -- C0 when carrying out C1 A ratio and C2 C1 The ratio was measured.

[0062] Moreover, the readout of each bar code was performed about 100 samples, and (O) and less than 95% of case were evaluated for the case where the rate of a readout is 95% or more, as (x). Furthermore, the printing object was observed visually and (x) and the case where it was not blurred were evaluated for the case where it is blurred, as (O). Moreover, lightfastness was evaluated, having measured the output after saving a printing object under a 5000 luxs fluorescent lamp for 100 hours, having investigated the maintenance factor of an output, and having used (O) and less than 70% of case as (x) for the case where the maintenance factor of an output is 70% or more. As a result, the following table 2 is.

[0063]

表2

	滲み	$C_0 / C_1$ (%)	$C_2 / C_1$ (%)	読み取り	耐光性
実施例2	○	2.5	15	○	○
" 3	○	2.5	10	○	○
比較例2	×	2.4	0	×	○
" 3	×	2.6	0	×	○
" 4	○	2	10	×	×

[0064]

[Effect of the Invention] The ink constituent which used the fluorescence organic pigment obtained in the example 1 so that clearly from the above-mentioned table 1 What was printed with the ink constituent which used the fluorescence organic pigment

from which distributed stability was good and was acquired in the example 1 All are compared with what was printed and printed with the ink constituent which used the fluorescent dye of the example 1 of a comparison, there is no blot, lightfastness and a water resisting property are good, and it turns out that according to this invention there is no blot and the fluorescence ink constituent distributed stability, lightfastness, and a deck watertight luminaire excelled [ constituent ] in the sex is obtained.

[0065] Moreover, the infrared fluorescence mark (examples 2 and 3) which consists of a bar code printed by Japanese paper by this invention so that clearly from the above-mentioned table 2 The infrared fluorescence mark compare with the infrared fluorescence mark (the example 2 of a comparison thru/or 4) which consists of a bar code printed by conventional Japanese paper, there is no blot, and the rate of reading is good, and according to this invention from this It is hard to be influenced of a blot by the dirt on a mark, or ink, and it is hard to be influenced of the substrate of a marked object, and it turns out that it is the stable high-concentration infrared fluorescence mark which does not choose a marked object.

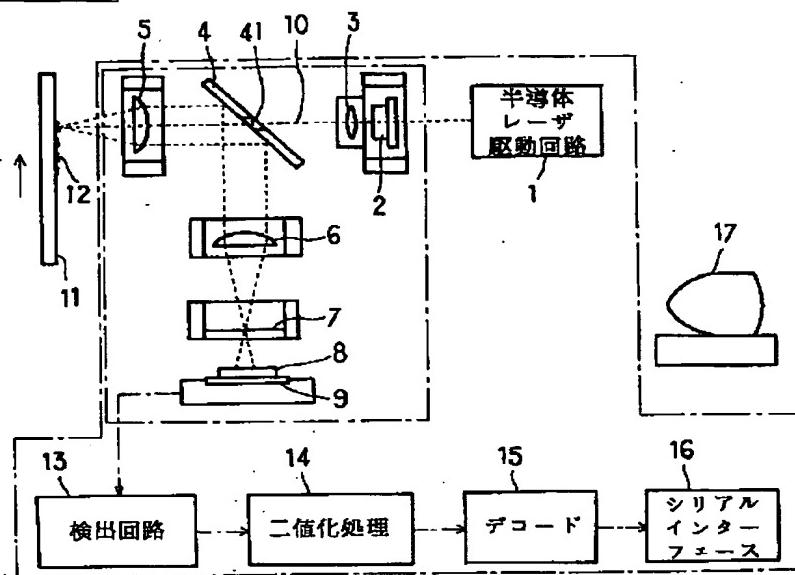
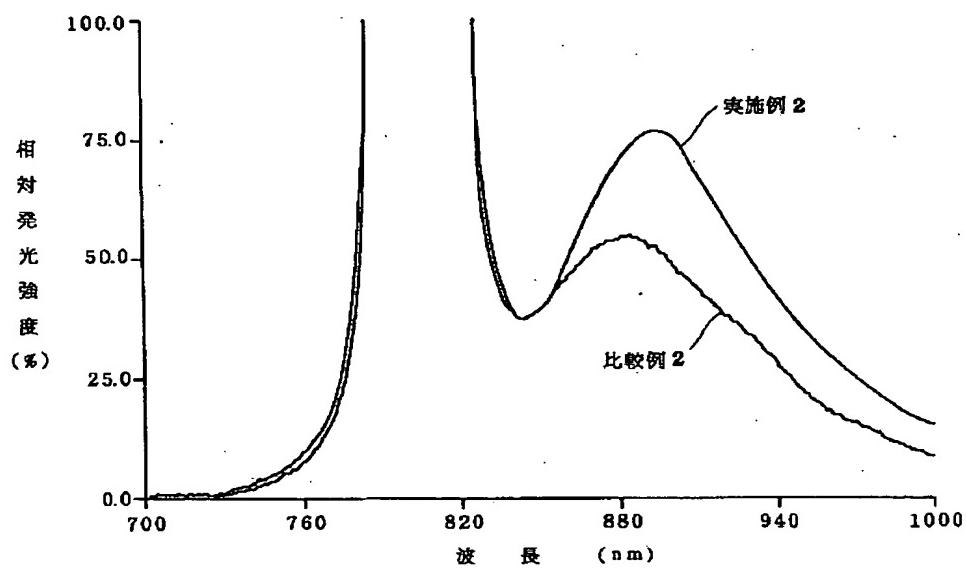
[0066] Furthermore, the infrared fluorescence mark (examples 2 and 3) which consists of a bar code printed by Japanese paper by this invention is understood that good reading is possible, without comparing with the infrared fluorescence mark which consists of an inorganic fluorescent substance of the example 4 of a comparison, and causing an operation mistake also in high-speed reading, and shelf life is still better.

**[Brief Description of the Drawings]**

**[Drawing 1]** It is approximate account drawing showing an example of the reader which detects infrared fluorescence.

**[Drawing 2]** It is the emission spectrum of the printing side of the printed matter obtained in the example 2 and the example 2 of a comparison.

**[Drawing 3]** It is the emission spectrum of the printing side of the printed matter obtained in the example 3 and the example 3 of a comparison.

[Drawing 1][Drawing 2]

[Drawing 3]

